IN THE SPECIFICATION

The paragraphs at page 11, line 25 to page 12, line 13, have been amended as follows:

"~~**FIG. 4** is a block diagram of the stimulation device of **FIGS. 1** and **2**, illustrating a switch bank with three connection ports;~~

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~~**FIG. 4**~~ **FIG. 3** is a circuit diagram illustrating the biventricular pacing electrode configuration used by the stimulation device of **FIG. 2** according to one embodiment of the present invention;

~~**FIG. 5**~~ **FIG. 4** is an illustration of the biventricular sensing electrode configuration used by the stimulation device of **FIG. 2** according to one embodiment of the present invention;

~~**FIG. 6**~~ **FIG. 5** is an illustration of an alternative biventricular sensing electrode configuration used by the stimulation device of **FIG. 2**;

~~**FIG. 7**~~ **FIG. 6** is a graphical depiction of the electromyographic signal received by the biventricular sensing electrode configuration of ~~**FIG. 5**~~ **FIG. 4** when loss of capture has occurred;

~~**FIG. 8**~~ **FIG. 7** is a graphical depiction of the electromyographic signal received by the biventricular sensing electrode configuration of ~~**FIG. 5**~~ **FIG. 4** when biventricular capture has occurred;

~~**FIG. 9**~~ **FIG. 8** is a circuit diagram illustrating an impedance measurement configuration according to an alternative embodiment of the present invention; and

~~**FIG. 10**~~ **FIG. 9** is a graphical depiction of the impedance signal measured by the impedance measurement configuration of ~~**FIG. 9**~~ **FIG. 8**."

The paragraph at page 14, lines 10-22, has been amended as follows:

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"The stimulation device 10 includes a housing 40 which is often referred to as "can", "case" or "case electrode", and which may be programmably selected to act as the return electrode for all "unipolar" modes. The housing 40 may further be used as a return electrode alone or in combination with one or more of the coil electrodes 28, 36, or 38, for shocking purposes. The housing 40 further includes a connector (or a plurality of connectors 150, 152, 154, as it will be described in connection with **FIG. 3**

~~FIG. 4~~) having a plurality of terminals, 42, 43, 44, 45, 46, 48, 52, 54, 56, and 58. For convenience, the names of the electrodes to which they are connected are shown next to the corresponding terminals. As an example, to achieve right atrial sensing and pacing, the connector includes at least a right atrial tip terminal 42 adapted for connection to the atrial (A_R) tip electrode 22."

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The paragraph at page 15, lines 4-12, has been amended as follows:

"In the embodiment of **FIGS. 1** and **2**, and as further illustrated in ~~**FIG. 4**~~ **FIG. 3**, the stimulation device 10 is illustrated to include three bipolar connection ports 150, 152, 154. A left ventricular/atrial connection port (LV / LA connection port) 150 accommodates the left ventricular lead (LV lead) 24 with terminals 44, 45, 46, 48 that are associated with the left ventricular tip electrode (LV tip electrode) 26, the left ventricular ring electrode (LV ring electrode) 25, the left atrial ring electrode (LA ring electrode) 27, and the left atrial coil electrode (LA coil electrode) 28, respectively."

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The paragraph at page 23, lines 12-29, has been amended as follows:

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"Having described the environment in which the present invention operates, an exemplary preferred embodiment of the present invention will now be described in detail. ~~**FIG. 4**~~ **FIG. 3** is an illustration depicting an equivalent circuit diagram of the electrode configuration used for biventricular pacing in accordance with a preferred embodiment of the present invention. A cross-chamber electrode configuration, defined as a polarity configuration comprising two or more electrodes existing on at least two different lead bodies located in two different heart chambers, is used for cross-ventricular pacing. A pacing pulse is delivered by the ventricular pulse generator 72 between the left ventricular (V_L) tip electrode 26 and the right ventricular (V_R) tip electrode 32. To maintain a potential difference between these two tip electrodes 26 and 32, the ventricular pacing pulse is inverted by an inverter 122 prior to delivering the pulse to the right ventricular (V_R) tip electrode 32. A positive pacing pulse 210 is delivered to the left ventricular (V_L) tip electrode 26 and a negative pacing pulse 212 is

A4 delivered to the right ventricular (V_R) tip electrode 32. Thus, a cross-chamber, biventricular pacing configuration is provided."

The paragraph at page 25, lines 5-25, has been amended as follows:

"A further aspect of the present invention is the programmable selection of the direction of current flow between the stimulating electrodes 26, 32. In the embodiment shown in ~~FIG. 4~~ **FIG. 3**, the direction of the current flow will be from the right ventricular (V_R) tip electrode 34 to the left ventricular (V_L) tip electrode 26 since the negative going pulse is applied to the right ventricular (V_R) tip electrode 32, and the positive going pulse is applied to the left ventricular (V_L) tip electrode 26. By selectively applying the reverse voltage polarity, that is the negative going pulse to the left ventricular (V_L) tip electrode 26, and the positive going pulse to the right ventricular (V_R) tip electrode 32, the direction of the current flow will be reversed. Hence, the sequence of myocardial tissue activation can be influenced by selecting the direction of current flow. This selection allows specificity of activation sequence based on the patient's need. For example, in a patient suffering from dilated cardiomyopathy, typically the left ventricle is predominately affected in the earlier stages of the disease. The dilated left ventricle has diminished contractility causing its contraction to be slower and weaker than the still healthy right ventricle. Thus, by selecting the stimulation pathway direction from the left ventricle to the right ventricle, the slower left ventricle contraction is initiated prior to the faster right ventricle contraction, yielding superior synchronization of right ventricle and left ventricle contractions."

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The paragraph at page 25, line 26 to page 26, line 2, has been amended as follows:

"A further aspect of the present invention is the selection of the pacing pulse morphology. In the embodiment of ~~FIG. 4~~ **FIG. 3**, a biventricular pacing pulse is illustrated where a positive going pulse 210 is applied to one electrode and a negative going pulse 212 is applied to a second electrode. Other pacing pulse morphologies are possible. For example, a balanced monophasic pacing pulse, or a biphasic pacing

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a6 pulse could be applied to one electrode tip while the other electrode tip remains neutral, functioning as the return path for the conducted current."

The paragraph at page 26, lines 9-18 has been amended as follows:

A7 "~~FIG. 5~~ FIG. 4 depicts an exemplary sensing configuration for a biventricular stimulation system in accordance with the present invention. Ventricular sensing circuitry 84 samples the myoelectric signal between the left atrial (A_L) ring electrode 27 and the right ventricular (V_R) ring electrode 34. Thus a cross-chamber, cross-ventricular sensing configuration is provided. Ventricular pulse generator 72 (**FIG. 2**) delivers pacing pulses via the left and right tip electrodes 26 and 32, respectively, as described earlier in conjunction with ~~FIG. 4~~ FIG. 3. In this way, the cross-chamber sensing configuration is not impaired by lead polarization effects, thus providing a superior sensing configuration for detecting and verifying capture."

The paragraph at page 26, line 27 to page 27, line 3, has been amended as follows:

A8 "Continuous automatic capture verification is performed by sampling the signal received on the left and right ring electrodes 27 and 34, respectively, following delivery of a ventricular stimulation pulse (Vpace) on the left and right tip electrodes 26 and 32, respectively. Essentially, cross-ventricular sensing of the evoked R-wave is achieved. Using this cross-chamber sensing configuration, the R-wave depolarization in the left ventricle and the R-wave depolarization in the right ventricle will be sensed as a single complex as illustrated by the internal electromyogram (IEGM) recordings in ~~FIGS. 7~~ FIGS. 6 and ~~8~~ 7. "

The paragraph at page 27, lines 4-10, has been amended as follows:

"~~FIG. 7~~ FIG. 6 illustrates a situation of loss of capture, where a stimulation pulse 134 is followed by a time delay 136 followed by an intrinsic response 138 is observed. ~~FIG. 8~~ FIG. 7 illustrates a situation of simultaneous capture in both the left and right ventricles. In this case, a stimulation pulse 150 is of sufficient energy to depolarize the

A8 cardiac tissue, resulting in a large evoked response 152 immediately following the stimulation pulse 150."

The paragraph at page 27, line 22 to page 28, line 3, has been amended as follows:

A9 "Yet a further aspect of the present invention is a programmable selection of cross-chamber, unipolar, or bipolar sensing. The embodiment illustrated in ~~FIG. 5~~ FIG. 4 allows cross-chamber sensing of the R-wave produced in both ventricles using a unique cross-chamber electrode configuration. However, other cross-chamber sensing configurations are possible that will satisfy the object of the present invention in reliably sensing the evoked response. One such alternative sensing configuration is illustrated in ~~FIG. 6~~ FIG. 5, according to which, biventricular stimulation is performed in similar configuration as in ~~FIG. 5~~ FIG. 4, however biventricular bipolar sensing is performed in the left ventricle between the left atrial (A_L) ring electrode 27 (or a ventricular ring electrode (not shown)) and the left ventricular (V_L) tip electrode 26, and in the right ventricle between the right ventricular (V_R) ring electrode 34 and the right ventricular (V_R) tip electrode 32."

The paragraph at page 29, line 6 to page 30, line 25, has been amended as follows:

A10 "In another embodiment, impedance measurements can be made by an impedance measurement circuitry 112 (**FIG. 2**) for capture verification rather than evoked response detection from the IEGM. The use of the four electrode terminals (26, 27, 32, 34) on the coronary sinus lead 24 and the right ventricular lead 30, makes possible a highly sensitive cardiac impedance measurement. The equivalent circuit diagram of ~~FIG. 9~~ FIG. 8 illustrates the measurement configuration. The application of an excitation current pulse 280 across the left ventricular (V_L) tip electrode 26 and the right ventricular (V_R) tip electrode 32, generates a voltage differential V_S 282 that can be measured across the left atrial (A_L) ring electrode 27 and the right ventricular (V_R) ring electrode 34. The impedance can then be calculated by the microprocessor 60 according to the following equation:

$$Z = I / V,$$

where Z is the impedance associated with the myocardial tissue and blood volume residing between the left ventricular (V_L) tip electrode 26 and the right ventricular (V_R) tip electrode 32, I is the applied excitation current pulse 280, and V_S is the measured voltage differential 282 that appears across the left atrial (A_L) ring electrode 27 and the right ventricular (V_R) ring electrode 34. Since the impedance measurement is made directly across the ventricles, it provides a direct measure of cardiac impedance with minimal influence of changes in thoracic impedance due to respiration. This more direct measure holds an advantage over impedance measurements that are performed between a lead electrode and the pacemaker can since, in those measurements, thoracic impedance may contribute to the measured signal to the same degree or an even greater degree than the cardiac impedance. Considerable signal processing is then needed to filter out the impedance signal associated with respiration."

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The paragraph at page 31, lines 1-7 has been amended as follows:

"~~FIG. 10~~ FIG. 9 is an illustration of the impedance signal change that may be measured during a ventricular contraction. The impedance Z is graphed along the Y-axis 296 versus time along the X-axis 295. The microprocessor 60 examines the impedance signal for specific characteristics that would indicate ventricular contraction has indeed occurred, such as the area of the curve 294, the peak slope dZ/dt 290, or the maximum peak deflection 292."

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